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ABSTRACT

Intended for nursing students, this programed workbook contains learning exercises and study tests on using household, apothecary, and metric systems in calculating medication dosages. The material, organized in six learning units, was designed to help students meet six objectives: correctly interpret and use accepted symbols and abbreviations in the different measuring systems when calculating and recording drugs and solutions; translate units of weight and measure into equivalents in other systems; solve dosage problems involving Roman numerals, decimals, fractions, ratio and proportion, addition, subtraction, division, and multiplication; calculate correct dosages when ordered in one system and available only in another; follow manufacturer's instructions for making powdered drugs into solutions for parental administration; and determine the amount of medication to withdraw from multidose vials to obtain exact dosages. Each learning unit contains a pretest (which, if the student responds correctly, indicates the unit may be skipped) and learning exercises with memorization and self-test sections. When the unit is completed, the student takes the pretest again and does not go on to subsequent units before passing it. Units cover: abbreviations, symbols, and approximate equivalents; determining dosages; using ratio and proportion; adding diluents to powdered medications; and drugs and solutions. (TE)

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CALCULATING DOSAGES

A

Programed Learner

for

Student Nurses

Developed
by
Mary Hare

July, 1977

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THE USE OF HOUSEHOLD, APOTHECARIES' AND METRIC SYSTEMS IN CALCULATING DOSAGES

GENERAL OBJECTIVES

Without the use of tables, a nursing student will be able to give the approximate equivalent of any household, apothecaries' or metric measurement in either of the other two systems and demonstrate his/her knowledge by correct preparation of a drug and accurate use of provided common graduated equipment.

SPECIFIC OBJECTIVES

1. The student will be able to correctly interpret and use accepted symbols and abbreviations of the household, apothecaries' and metric systems in calculating and recording drugs and solutions.

2. Given one of the more commonly used units of weight or measure in one of the three systems, the student will be able to give its approximate equivalent in either of the other two systems.

3. Given problems in dosage involving Roman numerals, decimals, fractions, ratio and proportion, addition, subtraction, division or multiplication, the student will be able to solve them with 100% accuracy.

4. Given a dosage ordered in one system that is available only in another system, the student will be able to calculate the correct dosage to give a patient.

5. Given a powdered drug to be made into a solution for parental administration, the student will read and follow the manufacturer's instructions to obtain the correct concentration to be administered.

6. Given a multidose vial of medication, the student will be able to calculate the amount to withdraw to obtain the correct dosage.

UNIT I - PRETEST

Abbreviations, Symbols and Approximate Equivalents.

DIRECTIONS: Complete this pretest then check your answers on the next page. If you get them all correct, skip this unit of the learning packet and proceed with the pretest on Unit II.

I. Give the meaning of the following abbreviations:

ʒ = _____

ʒʒ = _____

gtt. = _____

mg. = _____

gr. = _____

Gm. = _____

Kg. = _____

ml. = _____

cc. = _____

L. = _____

pt. = _____

qt. = _____

$\overline{ss}$ = _____

II. Fill in the approximate equivalents in the appropriate blanks:

ʒ ℥ = _____ cc. = _____ teaspoons

ʒ ℈ = _____ cc. = _____ teaspoons

gr $\overline{xv}$ = _____ Gm. = _____ cc.

1 pt. = _____ cups = _____ cc.

90 mg. = _____ grs.

½ cc. = _____ gtts.

500cc. = _____ cups

1 L. = _____ cc.

gr. $\overline{ss}$ = _____ mg.

gr. ¼ = _____ mg.

UNIT I - PRETEST ANSWERS

I. Abbreviations

ʒ = dram

ℨ = ounce

gtt. = minum

mg. = milligram

gr. = grain

Gm. = gram

Kg. = kilogram

ml. = milliliter

cc. = cubic centimeter

L. = Liter

pt. = pint

qt. = quart

$\overline{ss}$ = 1/2

II. Equivalents

ʒ ℩ = 4 cc. = 1 teaspoon

ℨ ℩ = 30-32 cc. = 8 teaspoons

gr $\overline{xv}$ = 1 Gm. = 1 cc.

1 pt. = 2 cups = 500 cc.

90 mg. = 1½ grs.

½ cc. = 8 gtts.

500cc. = 2 cups

1 L. = 1000 cc.

gr. $\overline{ss}$ = 30 mg.

gr. 1/4 = 15 mg.

UNIT I - PROGRAMMED LEARNER

Abbreviations, Symbols and Approximate Equivalents.

INSTRUCTIONS: In all units, cover right column until you have completed the testing, then compare answers. If you are having difficulty in a specific area, review that section in any one of the programmed learners on reserve in the library.

Biddle, Harry C. and Disa W. Sitler, The Mathematics of Drugs and Solutions. 7th Edition, F.A. Davis Company, Philadelphia.

Blume, Dorothy M. Dosage and Solutions. F.A. Davis Company, Philadelphia.

Fitch, Grace E. Arithmetic Review and Drug Therapy for Practical Nurses. 2nd Edition. MacMillan Company, New York.

Hart, Laura K. The Arithmetic of Dosages and Solutions. 2nd Edition. C.V. Mosby Company, Saint Louis.

Keane, Claire B. and Sybil M. Fletcher. Drugs and Solutions. 2nd Edition. W.B. Saunders Company, Philadelphia.

Squire, Jessie E. Basic Pharmacology for Nurses. 4th Edition. C.V. Mosby Company. Saint Lewis.

Weaver, Mabel E. and Vera J. Koehler, Programmed Mathematics of Drugs and Solutions. 1966 Revision. J. B. Lippincott Company, Toronto.

1. You probably already know most of the abbreviations for common household measurements for you use them all of the time.

gtt.	=	drop
tsp.	=	teaspoon
Tbsp.	=	tablespoon
oz.	=	ounce
c.	=	cup
pt.	=	pint
qt.	=	quart
gal.	=	gallon

2. Now write the meanings for each of the following abbreviations: (remember, cover the right hand column, then compare answers)

gtt.	=	_____	drop
tsp.	=	_____	teaspoon
Tbsp.	=	_____	tablespoon
oz.	=	_____	ounce
c.	=	_____	cup
pt.	=	_____	pint
qt.	=	_____	quart
gal.	=	_____	gallon

3. The following approximate equivalents are commonly accepted:

60 gtts.	=	1 tsp.
4 tsp.	=	1 Tbsp.
2 Tbsp.	=	1 oz.
8 oz.	=	1 cup
2 c.	=	1 pt.
2 pts.	=	1 qt.
4 qts	=	1 gallon

4. Fill in the approximate equivalents of the following:

1 Tbsp.	=	_____	gtts.	240
1 oz.	=	_____	Tbsp.	2
1 qt.	=	_____	pt.	2
1 qt.	=	_____	cups	4

5. You have probably also learned some abbreviations and symbols used in the hospital and by pharmacists, but let's review them.

mg. = milligram

gr. = grain

Gm. = Gram

Kg. = kilogram

gtt. = drop (minum)

m_x or m = minum

cc. = cubic centimeter, (milliliter)

ml. = milliliter,(cubic centimeter)

ʒ = dram (teaspoon)

℥ = ounce (notice this symbol has 2 notches above)

L. = liter

$\overline{ss}$ = 1/2

6. Write the meanings for each of the following abbreviations:

mg. = _____ milligram

℥ = _____ ounce

Gm. = _____ gram

gtt. = _____ drop

cc. = _____ cubic centimeter

ml. = _____ milliliter

ʒ = _____ dram

% = _____ per cent

$\overline{ss}$ = _____ 1/2

gr. = _____ grain

Kg. = _____ kilogram

m_x or m = _____ minum

L. = _____ liter

7. If you do not know their approximate equivalents, learn them as follows:

UNITS OF WEIGHT

60 mg.	= 1 gr.	1000 mg.	= 1 Gm.
15 gr.	= 1 Gm.	1000 Gm.	= 1 Kg.

UNITS OF FLUID

15-16 minums (gtts.) drops = 1 cc.

4 cc. = 60 minums = 1 dram = 1 teaspoon

15-16 cc. = 4 teaspoons = 1 Tbsp. = ½ oz.

30-32 cc. = 2 Tbsp. = 8 tsp. = 1 oz.

250 cc. = 1 cup = ½ pt.

500 cc. = 2 cups = 1 pt.

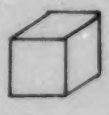
1000 cc. = 1 qt. = 1 L.

8. Now write the approximate equivalents to the following measures:

1 gr. =	_____	mg.	60
1 Gm. =	_____	gr.	15
1 Gm. =	_____	mg.	1000
1 Kg. =	_____	Gm.	1000
1 cc. =	_____	m$_x$	15-16
1 dr. =	_____	cc.	4
1 Tbsp. =	_____	dr.	4
1 oz. =	_____	Tbsp.	2
1 oz. =	_____	cc.	30-32
1 cup =	_____	cc.	250
1 pt. =	_____	cc.	500
1 L. =	_____	cc.	1000

9. To help you remember the ones you will use the most, look at the following diagrams for units of weight:

(think of grains of wheat)

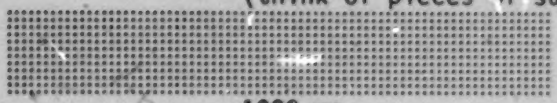
15 grains =  1 Gram

---

(think of pieces of sand)

60 mg. = 1 grain

(think of pieces of sand)



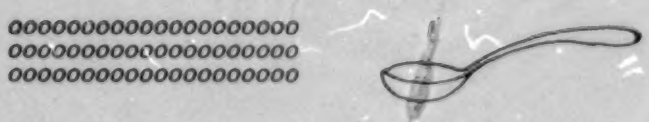
1000 mg. = 1 Gram

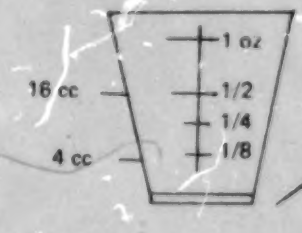
---

10. Now see if you can fill in these blanks:

_____ grains = 1 Gram	15 gr.
_____ mg. = 1 grain	60 mg.
_____ mg. = 1 Gram	1000 mg.

11. Here are some diagrams to help you remember units of fluid measurement. Try to visualize all those drops of water in a teaspoon and how much space that would fill in a medicine glass or syringe.





60 drops = 1 tsp. = 4 cc.

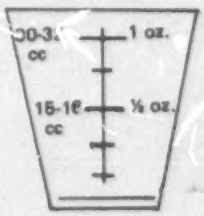
See if you can reproduce what you just learned:

= _____ drops, or _____ teaspoon, or _____ ml. = _____ cc. (60,1,4,4)

12. Eight teaspoons or drams will fill an ounce medicine cup full.

1 oz. = ____ teaspoons, ½ oz. = ____ teaspoons (8, 4)

13. Look at the following diagrams and visualize how many tablespoons there are in an ounce, and how many cc.'s there are in an ounce:



(3, 30-32 cc)

2 Tbsp. = ____ 3 = ____ cc.

SUGGESTED REFERENCES FOR FURTHER HELP

The Mathematics of Drugs and Solutions	pp. 35-52
Arithmetic Review and Drug Therapy for Practical Nurses.	pp. 47-55
The arithmetic of dosages and solutions.	pp. 1-63
Drugs and Solutions.	pp. 7-115
Basic pharmacology for nurses.	pp. 33-44
Programmed Mathematics of Drugs and Solutions.	pp. 3-30

* * * * * * * *

If you did not receive 100% on your pretest, now go back and retake it. When you receive 100% on the pretest you may proceed to Unit II. If you have trouble with Unit I after repeating it, please contact your instructor.

UNIT II - PRETEST

ARITHMETIC REVIEW: Roman Numerals, Fractions, Decimals, Addition, Subtraction, Multiplication, Division, Ration and Proportion.

DIRECTIONS: Complete this pretest as directed then compare your answers with the correct answers at the end. If all of your responses are correct, skip the learning portions of Unit II and go on to Unit III.

1. Express in Roman numerals:

   a. 17 _____

   b. 65 _____

2. Express in Arabic numerals:

   a. CX _____

   b. XL _____

3. Change to whole or mixed numbers:

   a. 12/6 _____

   b. 19/3 _____

   c. 25/5 _____

   d. 38/7 _____

4. Add the following fractions:

   a. 2 3/5 + 1 1/3 + 4 1/2 _____

   b. 7/9 + 9/10 + 2/15 _____

5. Add the following decimal fractions:

   a. .65 + .019 + .010 _____

   b. .375 + .5 + .69 _____

6. Add the following:

   a. 256.789 + 83.45 + 6.660 _____

   b. 3.542 + 89.650 + 53.3 _____

7. Subtract the following fractions and mixed numbers:

   a. 3/5 - 1/10 _____

   b. 2 1/4 - 3/8 _____

8. Subtract the following decimal fractions:

   a. 34.5 - 26.5 _____

   b. 189 - 5.29 _____

9. Multiply and reduce to the lowest denominator the following:

   a. 2/3 x 3/16 _____

   b. 15 x 1 4/5 _____

10. Multiply the following:

   a. 673.5 x .78 _____

   b. 150 x .34 _____

11. Divide the following and reduce:

   a. 5/8 ÷ 7/10 _____

   b. 2 ÷ 3/4 _____

12. Divide the following:

   a. 86 ÷ 23.5 _____

   b. 15.75 ÷ 2.5 _____

13. Which is the larger fraction?

   a. 1/2 or 2/5 _____

   b. 3/4 or 5/8 _____

   c. 0.006 or .03 _____

   d. 1:20 or 1:2 _____

14. Change the following to decimal fractions:

   a. 3/4 _____

   b. 9/10 _____

15. Solve for x in the following:

   a. 1:50 = x:100 _____

   b. 5:200 = x:4,000 _____

   c. 1/4:1/6 = 1:x _____

UNIT II

PRETEST ANSWERS

1. a. XVII
   b. LXV

2. a. 110
   b. 40

3. a. 2
   b. 6 1/3
   c. 5
   d. 5 3/7

4. a. 8 13/30
   b. 1 73/90

5. a. .679
   b. 1.565

6. a. 346.739
   b. 126.492

7. a. 1/2
   b. 1 7/8

8. a. 8
   b. 183.71

9. a. 6/48 = 1/8
   b. 27

10. a. 526.890
    b. 51.00

11. a. 25/28
    b. 2 2/3

12. a. 3.66
    b. 6.3

13. a. 1/2
    b. 3/4
    c. .03
    d. 1.2

14. a. .75
    b. .9

15. a. 2
    b. 100
    c. 2/3

UNIT II - PROGRAMMED LEARNER

Roman Numerals, Decimals, Addition, Subtraction, Multiplication, Division, Ratio & Proportion.

1. Now you will need to review Roman numerals, you will seldom use Roman numerals above 20, but should be able to recognize or write them up to 100 if necessary.

1 = I	11 = XI	30 = XXX
2 = II	12 = XII	40 = XL
3 = III	13 = XIII	50 = L
4 = IV	14 = XIV	60 = LX
5 = V	15 = XV	70 = LXX
6 = VI	16 = XVI	80 = LXXX
7 = VII	17 = XVII	90 = XC
8 = VIII	18 = XVIII	100 = C
9 = IX	19 = XIX	
10 = X	20 = XX	

Roman numerals are used in recording dosages such as:

Aspirin tab $\overset{\cdot\cdot}{\text{II}}$ with a line and dots above the number

2. Test yourself by filling in the Roman numerals for these Arabic numbers: (Cover the above numerals as well as the right column, then compare answers.)

	ANSWERS
1 = _____	I
4 = _____	IV
5 = _____	V
9 = _____	IX
10 = _____	X
14 = _____	XIV
15 = _____	XV
20 = _____	XX
29 = _____	XXIX
40 = _____	XL
50 = _____	L
90 = _____	XC
100 = _____	C

Record that you gave 4 tablets of gantrisin.

Ans._____

(gantrisin tab. $\overset{\cdot\cdot}{\text{IV}}$)

3. Now write Arabic numbers for these Roman numerals:

XIII	_____	13
VI	_____	6
XIX	_____	19
XV	_____	15
XXXIX	_____	39
LXXXIV	_____	84
XCVI	_____	96
XXII	_____	22
III	_____	3

4. Let's review decimals:

0.1 = 1/10

0.01 = 1/100

0.001 = 1/1000

5. Test yourself: (Cover number 4 above as well as right hand column while completing, then compare answers.)

0.1	=	_____	1/10
0.01	=	_____	1/100
0.001	=	_____	1/1000

6. In adding decimals, the decimal points must be directly under each other.

Example: 0.257 + 1.02957 + 102 =

```
  0.257
  1.02957
102.
-------
103.28657
```

7. Add together:

102.576 + .067 - 1.234 = _____ 103.877

8. In subtracting decimals, the decimal points must be directly under each other.

Example: 102.50 - 79.235

```
 102.50
-79.235
-------
 23.265
```

9. Subtract:

72.051 from 103.5203 = 31.4693

10. To multiply a number by 10, move the decimal point 1 place to the right.

Example: .006 x 10 = .06

11. Multiply by 10:

.06 = _____ .6

.007 = _____ .07

.0019 = _____ .019

12. To multiply a number by 100, move the decimal point 2 places to the right.

Example: .006 x 100 = 0.6

13. Multiply by 100:

.06 = _____ 6.0

.007 = _____ 0.7

.0019 = _____ 0.19

14. To multiply a number by 1000, move the decimal 3 places to the right.

Example: .006 x 1000 = 6

15. Multiply by 1000:

.06 = _____ 60

.007 = _____ 7.0

.0019 = _____ 1.9

16. To divide a number by 10, move the decimal point 1 place to the left.

Example: .6 ÷ 10 = .06

17. Divide by 10:

50 = _____ 5

.2 = _____ .02

.017 = _____ .0017

18. To divide a number by 100, move the decimal point 2 places to the left.

Example: 0.6 ÷ 100 = .006

19. Divide by 100:

50	=	_____	.5
.2	=	_____	.002
.017	=	_____	.00017

20. To divide a number by 1000, move the decimal point 3 places to the left.

Example: 0.6 ÷ 1000 = .0006

21. Divide by 1000:

50	=	_____	.05
.2	=	_____	.0002
.017	=	_____	.000017

22. To multiply decimals together, use the same procedure as in whole numbers then place your decimal point by adding the number of places in both figures and counting that many in your product.

Example:
$$\begin{array}{r} 10.315 \\ \times\ 0.256 \\ \hline 61890 \\ 51575 \\ 20630 \\ \hline 2.640640 \end{array}$$

NOTE: 3 decimal places in each, or a total of 6.

NOTE: 6 decimal places from right.

23. Test yourself:

Multiply 0.25 x 1.25 .3125

24. To divide by a decimal, both numbers must first be multiplied by a number large enough to make the divisor a whole number, then proceed as in dividing whole numbers.

Example: 5.25 ÷ .05 = 525 ÷ 5

$$.05\overline{)5.25} \qquad 105$$

25. Test yourself:

Divide 5.025 by .05 100.5

26. To convert a fraction into a decimal, divide the numerator by the denominator.

Example: 1/4 = _____

$$4\overline{)1.00} \qquad .25$$
$$\begin{array}{r} 8 \\ \hline 20 \\ 20 \end{array}$$

27. Test yourself:

Convert 2/5 into a decimal .4

28. Let's brush up a little on fractions.

29. The numerator is the number ON TOP in a fraction. In these fractions which are the numerators?

1/2	_____	1
2/5	_____	2
3/8	_____	3

30. The denominator is the number ON the BOTTOM in a fraction. In these fractions which are the denominators?

2/5	_____	5
6/11	_____	11
7/15	_____	15

31. If the numerators in two fractions are the same, the fraction having the smaller denominator has a larger value. In each of the following pairs of fractions, indicate which has the largest value.

1/150 or 1/200	_____	1/150
3/7 or 3/8	_____	3/7
6/15 or 6/17	_____	6/15
1/2 or 1/4	_____	1/2
1/32 or 1/16	_____	1/16

32. To multiply two fractions, multiply the two numerators together and the two denominators together. (This will be easier if you reduce numbers by cancelling first.)

Example: 1/8 x 8/9 = 1/9

33. Test yourself:

7/8 x 9/14 x 2/3 = _____ 3/8

34. In order to multiply by a mixed fraction, it must first be made into an improper fraction.

Example: 4 x 1 1/2 = 4 x 3/2 = 12/2 = 6

35. Test yourself:

12 x 1 2/3 = _____ 20

36. In division of fractions, the denominator is inverted, then the procedure is the same as multiplication.

Examples: 1/16 ÷ 2/3 = 1/16 x 3/2 = 3/32
8 ÷ 7 1/2 = 8 ÷ 15/2 = 8 x 2/15 = 16/15 = 1 1/15

37. Test yourself:

2 3/4 ÷ 1 7/8 = _____ 1 7/15

1 1/2 ÷ 3/4 = _____ 2

38. A ratio means "relation to" in Latin. In nursing it is usually used to express the relationship of a solute to a solution.

Example: 1:30,000 aqueous zephiran chloride means there is 1 part of zephiran chloride to 30,000 parts of water.

39. Test yourself:

1:750 aqueous zephiran chloride means _____ One part of aqueous zephiran to 750 parts of water.

40. Proportion means the relationship between two ratios and in nursing is usually used to determine what amount should be given when the available dose is different from the one ordered. First, let us solve a problem using proportion:

Example: 6:12 :: 9:18
This reads: 6 is to 12 as 9 is to 18

In solving this, the product of the means (the middle numbers) always equals the product of the extremes (the two outer numbers).

Solution: 12 x 9 = 6 x 18 or means → 6:12 :: 9:18 ← extremes

108 = 108

41. When one of the quantities in the proportion is unknown, x may be substituted for it and solved.

Example: 2:12 :: x:18

Step 1 - 12x = 2 x 18

Step 2 - 12x = 36

Step 3 - x = 36/12

Step 4 - x = 3

42. Now test yourself: 4:20 :: x:25 = _____ x = 5

SUGGESTED REFERENCES FOR FURTHER HELP

The Mathematics of Drugs and Solutions	pg. 9-32
Dosage and Solutions	Pg. 90-97
Arithmetic Review and Drug Therapy for Practical Nurses	Pg. 3-43
Drugs and Solutions	Pg. ~~25-52,~~ 62-78
Basic Pharmacology for Nurses	Pg. 22-32

Now, go back and take the pretest for Unit II on page 12 for the second time. If you still have trouble, contact your instructor.

UNIT III - PRETEST

Determining Dosage

DIRECTIONS: Complete this Pretest and correct it with the answers at the end of the test. If you get them all right, you may go on to Unit IV on page 25. If you missed any, complete Unit III and retake the Pretest.

1. Ordered : Paregoric 5 ml. orally
   Available: Paregoric 3ii
   Answer: _____

2. Ordered: PAS solution 50 mg.
   Available: PAS 0.5 Gm. per 5 cc.
   Answer: _____

3. Ordered: Ephedrine liquid 3 mg.
   Available: Ephedrine 1/8 gr. per 5 cc.
   Answer: _____

4. You are given a 10 ml. vial containing 1,000,000 U. potassium penicillin G with the instructions to add 2.1 ml. sterile diluent to the vial.
   a. If the drug displaces 0.4 cc., how much solution would you have when it is dissolved? _____ cc.
   b. How many units are there in each ml.? _____ U.

5. Ordered: Atropine 0.4 mg. "H"
   Available: Atropine tubex 1 mg. per cc.
   a. How much will you discard from the tubex? _____
   b. How much will you give to the patient? _____

6. Ordered: Pantopon 15 mg. "H"
   Available: Pantopon tubex containing 1/3 gr per cc.
   a. How much will you discard from the tubex? _____
   b. How much will you give to the patient? _____

7. Solve for dosage using ratio and proportion to find your answer.
   Ordered: Gantrisin 0.4 Gm. orally
   Available: Gantrisin suspension 100 mg. per ml.
   Equation:
   Answer:

8. Ordered: Elix. terpin hydrate with cod. 1/8 gr. orally
   Available: Elix. terpin hydrate with cod 2 mg. per cc.
   Equation:
   Answer: _____

9. Ordered: Penicillin G. susp. 300,000 U. orally
   Available: Penicillin G. susp. 150,000 U. per 5 cc.
   How much would you give? _____

10. Ordered: Sulfadiazine susp. 300 mg. orally
    Available: Sulfadiazine susp. 0.25 Gm. per 5 ml.
    How much would you give? _____

UNIT III - PRETEST ANSWERS

1. 5 cc. in a liquid measuring cup or household teaspoon (if for an infant measure and administer orally with a syringe).
2. 1/2 cc.
3. 2 cc.
4. a. 2 1/2 cc.
   b. 400,000 U.
5. a. 0.6 cc.
   b. 0.4 cc
6. a. 1/4 cc. or 4 minums
   b. 3/4 cc. or 12 minums
7. 4 cc.
8. 3.75 cc. or 3ss
9. 10 cc.
10. 6 cc.

UNIT III - PROGRAMMED LEARNER

Determining Dosage

Sometimes you will be required to determine the dosage to give when what is ordered comes in a different dosage than what you have on hand.

1. In setting up a problem for determining dosage, the following method is used:

$$\frac{\text{Desire}}{\text{Have}} \times \text{amount} = \text{answer}$$

For example, the doctor orders atropine gr. 1/150 H. All you have available are hypodermic tablets, gr. 1/300 each.

$$\frac{\text{gr } 1/150}{\text{gr } 1/300} \times 1 \text{ tab} =$$

Answer: 2 tablets

Solution: $\text{gr } \frac{1}{\cancel{150}\ 1} \times \frac{\cancel{300}^{\,2}}{1} \times 1 \text{ tab} = 2$

2. Here's another example:

Ordered: Demerol 75 mg. hypodermically

Available: Demerol 100 mg. per cc.

Answer: 3/4 cc. or 12 minums.

$$\frac{\cancel{75}^{\,3}}{\cancel{100}_{\,4}} \times 1 \text{ cc.} = \frac{3}{4} \times 1 \text{ cc/} = 3/4 \text{ cc.}$$

$$3/4 \times 16 \text{ minums} = 12 \text{ minums}$$

3. Now test yourself:

Ordered: M.S. gr. 1/6 I.M.

Available: M.S. gr. 1/8 per cc.

Solution:

Answer: 1 1/3 cc.

4. Sometimes the drug will be ordered in a different system than the dosage of the drug you have available. Before you can determine the correct dosage, you must convert one or the other so that the dosages are in the same system.

Example: Ordered: Pantopan 10 mg.

Available: Pantopan tab. 1/3 gr.

You could set this up either way and get the correct answer. First, lets convert the 10 mg. to grains by dividing by 60.

$$10/60 = 1/6 \text{ gr.}$$

Solving: $\frac{1/6}{1/3} \times 1 \text{ tab.} = 1/6 \times 3/1 = 1/2 \text{ tab.}$

Now let's convert the 1/3 gr. to mg. by multiplying by 60.

$$1/3 \times 60 = \frac{60}{3} = 20 \text{ mg.}$$

Solving: $\frac{10 \text{ mg.}}{\cancel{20}\ \text{mg.}} \times 1 = 1/2 \text{ tab.}$

5. Now test yourself:

Ordered: Aspirin 2/3 Gm. (You must convert 2/3 Gm. to grains first.)

Available: Aspirin gr. v per tablet

Solution:

Answer: _____ 2 tabs.

6. Now test yourself:

ANS.

Ordered: Codeine 40 mg.

Available: Codeine 1 gr. per c.c.

Solution: (Show your work)

$\frac{40mg}{60mg}$ x 1 = 2/3

$\frac{2}{3}$ x 15 minums = 10 minums

Answer: _____

7. Ordered: m.s. 1/8 gr

Available: m.s. 1/4 gr. per c.c.

Solution: (Show your work)

ANS.

$\frac{1/8}{1/4}$ x 1 cc = $\frac{1}{8}$ x $\frac{4}{1}$ = 1/2 cc

Answer: _____

UNIT IV

Using Ratio & Proportion

1. In setting up a proportion problem for determining dosage, the following method is used:

   Desire: Have :: x : amount

   For example, the doctor orders atropine gr. 1/300 H. All you have available are hypodermic tubexes, gr. 1/150 per cc.

   Using the above method:

   1/300 : 1/150 :: x : 1

   1/150 x = 1/300

   x = 1/300 x 150/1 = 1/2 (You would give 1/2 cc.

   x = 1/2

2. Here's another example:

   Ordered: Demerol 75 mg. hypodermically

   Available: Demerol 100 mg. per cc.

   Solution: 75:100 :: x:1

   100 x = 75

   x = 75/100

   x = 3/4 cc. (3/4 x 16 m_x = 48/4 m_x = 12 m_x.)

   Answer: _____ (3/4 cc. or 12 minums.)

3. Now test yourself:

   Ordered: M.S. gr. 1/6 I.M.

   Available: M.S. gr. 1/8 per cc.

   Solution:

   Answer: _____ (1 1/3 cc.)

UNIT V

Adding a Diluent to Powdered medications in a Vial

Occasionally you will be required to mix a powdered drug in a vial with a diluent (normal saline or sterile water) for parental administration. It is necessary for you to follow the manufacturer's instructions in adding the diluent to make the correct concentration. *The powder will dissolve and take up some space so the resulting solution will always be more than the amount of diluent you added.

Example: You have a 10 cc vial containing 1,000,000 units of powdered Penicillin G.

To get 100,000 units per cc., add 9.6 cc.diluent and mix well.

You will have 10 cc. in your vial; each cc. with 100,000 U. Penicillin G.

To get 200,000 units per cc., you will add 4.6 cc. diluent.

To get 250,000 units per cc., you will add 3.6 cc. diluent.

Caution: After adding diluent, remove the same amount of air from the vial to equalize the pressure inside the vial. Be sure to label the vial with the concentration, date prepared and your initials--refrigerate if indicated.

9. Now test yourself:

You have a 10 ml. vial containing 1,000,000 units of potassium penicillin G in powder form. You are instructed to add 2.1 ml. sterile diluent to make a concentration of 400,000 U./ml. Explain what you would do:

_____

_____

_____

Answer: Using sterile technique I would add 2.1 ml. sterile diluent, mix well, and label 400,000 U./ml., date and initial it and refrigerate it if instructed to do so on the vial.

10. Ordered: Keflin 750 mg.

Available: Powdered ampules of 1 Gm, 2 Gm, or 4 Gm.

Which ampule would you choose? _____ 1 Gm.

After following directions for reconstitution so that each cc. has 500 mg., how much would you give? _____ 1 1/2 cc.

Now you are ready to take your final test. If you are unsure in any area, review that section in a programmed learner in the library or see your instructor. As soon as you have completed the post-test, take it to your instructor to be graded.

CITATIONS FOR FURTHER AID

The Mathematics of Drugs and Solutions	pp. 59-78
Dosage and Solutions	pp. 2-73
Arithmetic Review and Drug Therapy for Practical Nurses	pp. 56-78
The Arithmetic of Dosages and Solutions	pp. 27-35, 65-73
Drugs and Solutions	pp. 117-140
Basic Pharmacology for Nurses	pp. 75-91
Programmed Mathematics of Drugs and Solutions	pp. 31-94

UNIT VI - TEST

Determining Dosage

STUDENT_____

DATE_____

DIRECTIONS: Please complete the following test without looking back in the learning packet or consulting any references, then turn it in to your instructor.

I. DEFINE:

ʒ = _____

ʒ = _____

gtt. = _____

gr. = _____

mg. = _____

cc. = _____

pt. = _____

ss = _____

II. COMPLETE:

ʒi = _____ cc. = _____ teaspoons

ʒi = _____ cc. = _____ teaspoons

Gm. i = _____ gr.

1/2cc. = _____ gtts.

gr. ss = _____ mg.

gr. 1/4 = _____ mg.

90 mg. = _____ grs.

1 L. = _____ cc. = _____ qt.

III. Write the Roman numerals for:

6 _____

11 _____

16 _____

19 _____

24 _____

IV. Write the Arabic numbers for the following Roman numerals

XVII _____

XXXIX _____

XIV _____

VIII _____

LX _____

V. Divide 0.234 by .05

Answer_____

VI. Multiply 3.27 by .021

Answer_____

VII. Multiply 0.127 by 1000

Answer_____

VIII. Divide .2525 by 100

Answer_____

IX. Divide 0.253505 by .005

Answer_____

X. Which is larger?

a. 1/3 or 2/5 _____

b. 3/4 or 5/6 _____

c. 1/150 or 1/300 _____

d. 1/32 or 1/16 _____

e. 1/4 or 1/2 _____

XI. Multiply the following fractions together:

1/4 x 2/5 x 3/6 x 2 1/3 Answer _____

XII. Solve the following problems:

a. The doctor has ordered Kantrex 150 mg. I.M. $\bar{q}$ 12 hrs. for your patient. You have a vial marked 0.5 Gm. per 2 cc.

How much would you give Answer _____

b. You have to give Phenobarbital 1/2 gr. orally. You have tablets available marked 30 mg. and 60 mg.

Which would you give? Answer _____

c. You must give Elixir Terpin Hydrate with Codeine, 1/8 gr. for coughing. The bottle is marked 2 mg. per ml.

How much would you give? Answer _____

d. The doctor has ordered Ilotycin suspension 400 mg. orally. You have available Ilotycin suspension 0.2 Gm. per 5 cc.

How much would you give? Answer _____

XIII. The doctor has ordered Crystalline Penicillin G 100,000 U. You have a vial of powdered Crystalline Penicillin G labeled 1,000,000 U.

How would you prepare the dosage and how much would you give?

Answer: Add _____ cc. diluent and give _____cc.

XIV. The doctor has ordered Atropine Sulfate 0.6 mg. for your patient. You have available tubexes of Atropine Sulfate 0.4 mg. per cc.

How much would you give? _____

Answer:

b. The doctor has ordered Codeine Sulfate 40 mg. "H" for pain. You have 2 cc. tubexes with gr. 1/2 per cc. available.

How much would you give?

Answer _____cc or _____ minums

UNIVERSITY OF CALIF.
LOS ANGELES

JUN 23 1978

CLEARINGHOUSE FOR
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